

# Prenatal Development

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## THINK ABOUT

The nine months before a baby is born is a time of important development both for baby and parents. The fetus develops in response to its unique genetic package and the environment provided by the mother. Each stage of fetal growth has effects on the mother, and while these effects are predictable, each woman experiences them individually, if at all. Overall, the general health of an expectant mother, good prenatal care, and her choice of a healthy life-style are critical to a baby's healthy development.

## ASK YOURSELF

Study the photo on the opposite page and imagine a conversation between the

pregnant woman and the child. What would each be saying? How is the woman helping the girl understand prenatal development? If the woman is the girl's mother, how does this exchange encourage a bond between the girl and her new brother or sister?

## NOW TRY THIS

Write a list of factors that you think might have an effect on a baby while it is in the womb. Remember to think of factors related to environment, nutrition, and heredity. Next to each factor, identify one positive life-style choice that a mother can make to ensure healthy prenatal development for her child. Volunteer to explain the choices you list.

## SECTION 1



### TERMS TO LEARN

amniotic fluid  
conception  
embryo  
fetus  
ovum  
placenta  
prenatal  
sperm  
umbilical cord  
uterus  
zygote

# Forty Weeks of Preparation

### OBJECTIVES

- Name the three stages of pregnancy.
- Describe the prenatal development during each of the three stages of pregnancy.

**D**uring pregnancy, a single cell grows and develops into a human being capable of independent existence. This amazing process takes place over a period of 40 weeks (or about nine months).

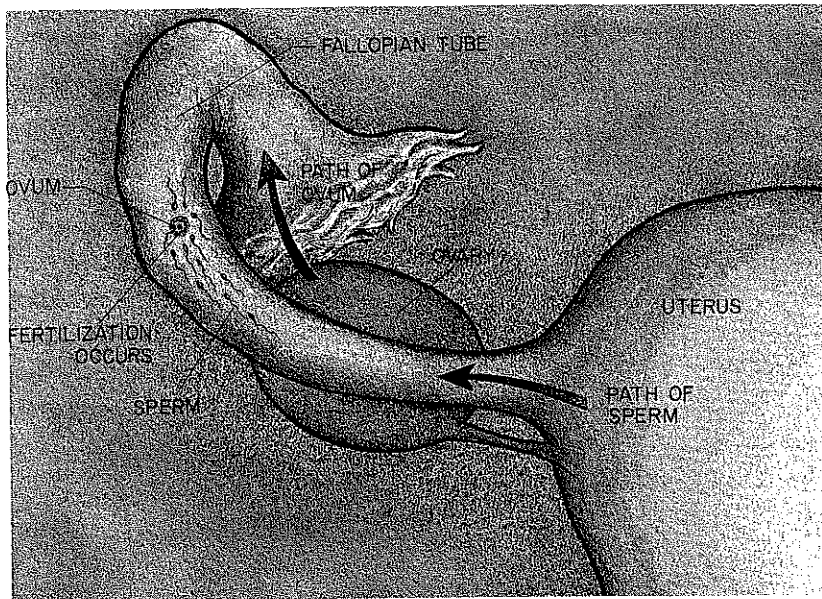
## Prenatal Development

**Prenatal** development is the development of a baby *during the period before birth*. Prenatal development is usually considered in three stages: the period of the zygote, the period of the embryo, and the period of the fetus. The chart on pages 118-119 shows how the unborn baby develops during these three periods. It also shows corresponding physical changes in the mother.

## Conception

Once each month, an **ovum**—a female cell or egg—is released by one of a woman's ovaries. The egg moves through the Fallopian tube to the **uterus**, or womb, *the organ in a woman's body in which a baby develops during pregnancy*. This short journey takes about two or three days. It is only in the Fallopian tube that fertilization can take place.

When the egg reaches the uterus, it usually disintegrates and is flushed away with the menstrual flow. However, if the egg meets and is fertilized in the Fallopian tube by a **sperm**, or male cell, **conception**—the union of an ovum and a sperm, resulting in the beginning of pregnancy—takes place. This union is called a zygote.



Conception—the beginning of pregnancy—occurs when an ovum is fertilized. The ovum is about the size of the dot over a printed letter i.

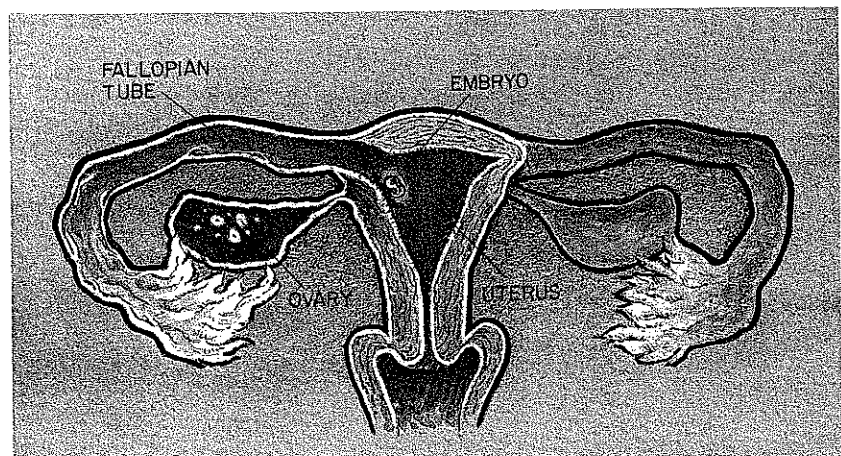
## Period of the Zygote

The first stage in the development of a human baby is called the period of the **zygote**, or *fertilized egg*. It lasts approximately two weeks.

When the fertilized egg reaches the uterus, it attaches itself to the thickened lining of the uterus and begins to grow. Since the lining is needed to nourish the fertilized egg, it cannot be shed in menstruation as usual. Therefore, menstruation does not take place. The woman's menstrual periods stop and will not begin again until after the baby is born.





The thickened lining of the uterus provides both a soft, warm bed and food for the fertilized egg. It grows by a process called cell division. This single, complete cell divides and becomes two. Two cells become four and so on, until there is a mass of cells. In spite of the remarkable growth during this period, at the end of two weeks, the zygote is still only the size of a pinhead.

The embryo has made its home by attaching itself to the inner lining of the uterus. The uterus is about 3 inches long at this stage. The embryo is still smaller than a grain of rice.








## PRENATAL DEVELOPMENT MONTH BY MONTH

Keep in mind that growth patterns and reactions are individual. Not all babies develop at exactly the same rate, nor does every pregnant woman experience all of the effects described here.

	PRENATAL DEVELOPMENT	EFFECTS ON MOTHER
During the First Month  	<ul style="list-style-type: none"> <li>• Cell multiplication begins.</li> <li>• The fertilized egg attaches itself to the lining of the uterus.</li> <li>• Internal organs and the circulatory system begin to form. The heart begins to beat.</li> <li>• By the end of the month, small bumps indicate the beginning of arms and legs.</li> </ul>	<ul style="list-style-type: none"> <li>• Missed menstrual period.</li> <li>• Other signs of pregnancy may not yet be noticeable.</li> </ul>
During the Second Month  	<ul style="list-style-type: none"> <li>• At five weeks, the embryo is only about 1/4 inch (6 mm) long.</li> <li>• Face, eyes, ears, and limbs take shape.</li> <li>• Bones begin to form.</li> <li>• Internal organs continue to develop.</li> </ul>	<ul style="list-style-type: none"> <li>• Breasts begin to swell.</li> <li>• Pressure on bladder from enlarging uterus results in need to urinate more frequently.</li> <li>• Possible nausea ("morning sickness").</li> <li>• Fatigue is common.</li> </ul>
During the Third Month  	<ul style="list-style-type: none"> <li>• As this month begins, the fetus is about 1 inch (25 mm) long.</li> <li>• Nostrils, mouth, lips, teeth buds, and eyelids form.</li> <li>• Fingers and toes are almost complete.</li> <li>• All organs are present, although immature.</li> </ul>	<ul style="list-style-type: none"> <li>• Breasts become firmer and fuller and may ache.</li> <li>• Nausea, fatigue, and frequent urination may continue.</li> <li>• Abdomen becomes slightly larger. The uterus has grown to about the size of an orange.</li> <li>• Weight gain totals 2-4 pounds (0.9-1.8 kg).</li> </ul>
During the Fourth Month  	<ul style="list-style-type: none"> <li>• At the beginning of this month, the fetus is about 3 inches (76 mm) long and weighs about 1 ounce (28 g).</li> <li>• The fetus can suck its thumb, swallow, hiccup, and move around.</li> <li>• Facial features become clearer.</li> </ul>	<ul style="list-style-type: none"> <li>• Size change continues slowly.</li> <li>• Most discomforts of early pregnancy are usually gone by this time.</li> <li>• Appetite increases.</li> </ul>

(Continued on next page)

# **PRENATAL DEVELOPMENT MONTH BY MONTH**

	PRENATAL DEVELOPMENT	EFFECTS ON MOTHER
During the Fifth Month 	<ul style="list-style-type: none"> <li>As this month begins, the fetus is about 6 1/2-7 inches (16-18 cm) long and weighs about 4-5 ounces (113-142 g).</li> <li>Hair, eyelashes, and eyebrows appear.</li> <li>Teeth continue to develop.</li> <li>Organs are maturing.</li> <li>The fetus becomes more active.</li> </ul>	<ul style="list-style-type: none"> <li>Enlarged abdomen becomes apparent.</li> <li>Slight fetal movements are felt.</li> <li>Fetal heartbeat may be heard through a stethoscope.</li> <li>Increased size may begin to affect posture.</li> </ul>
During the Sixth Month 	<ul style="list-style-type: none"> <li>The fetus is now about 8-10 inches (21-25 cm) long and weighs about 8-12 ounces (227-340 g).</li> <li>Fat is being deposited under the skin, but the fetus still appears wrinkled.</li> <li>Breathing movements begin.</li> </ul>	<ul style="list-style-type: none"> <li>Fetal movements are now sensed as strong kicks, thumps, and bumps. Some may be visible.</li> <li>Weight gain by the beginning of this month may total 10-12 pounds (4.5-5.4 kg).</li> </ul>
During the Seventh Month 	<ul style="list-style-type: none"> <li>The fetus is about 10-12 inches long and weighs about 1 1/2-2 pounds (680-907 g).</li> <li>Periods of fetal activity are followed by periods of rest and quiet.</li> </ul>	<ul style="list-style-type: none"> <li>Increased size may begin to affect posture.</li> </ul>
During the Eighth Month 	<ul style="list-style-type: none"> <li>Weight gain continues rapidly. The fetus is about 14-16 inches (36-41 cm) long and weighs about 2 1/2-3 pounds (1.0-1.4 kg).</li> <li>The fetus may react to loud noises with a reflex jerking action.</li> <li>In most cases, the fetus moves into a head-down position.</li> </ul>	<ul style="list-style-type: none"> <li>There may be discomfort as size increases. Backache, leg cramps, shortness of breath, and fatigue are common.</li> <li>Fetal kicks continue to be felt; they may disturb the mother's rest.</li> <li>At the beginning of this month, weight gain totals about 18-20 pounds (8.2-9.1 kg).</li> </ul>
During the Ninth Month 	<ul style="list-style-type: none"> <li>At the beginning of the final month, the fetus is about 17-18 inches (43-46 cm) long and weighs about 5-6 pounds (2.3-2.7 kg). Weight gain continues until the week before birth.</li> <li>Skin becomes smooth as fat deposits continue.</li> <li>Fetal movements decrease as the fetus has less room to move around.</li> <li>The fetus acquires disease-fighting antibodies from the mother's blood.</li> <li>The fetus descends into the pelvis, ready for birth.</li> </ul>	<ul style="list-style-type: none"> <li>"Lightening" is felt as the fetus drops into the pelvis. Breathing becomes easier.</li> <li>Other discomforts of late pregnancy may continue.</li> <li>A total weight gain of 24-30 pounds (10.9-13.6 kg) is typical. The uterus is the size of a small watermelon by the time of birth.</li> <li>False labor pains may be experienced.</li> </ul>

## Period of the Embryo

The second stage of pregnancy is the period of the embryo. The **embryo** is the developing cluster of cells in the uterus during about the third through eighth weeks of pregnancy. In the course of this period, an amazing change occurs as the mass of embryonic cells develops into all the major organ systems of the human body.

Throughout this stage, the embryo grows rapidly. It becomes firmly attached to the inner lining of the uterus. By the end of this stage, the **placenta**, the tissue that connects the sacs around the unborn baby to the mother's uterus, has developed. The **umbilical cord**, a long tube that connects the placenta to the unborn baby, has also developed. Nourishment and oxygen from the mother's bloodstream are carried from the placenta to the developing baby through the umbilical cord.

The umbilical cord is uniquely formed to supply nourishment to the baby and to take waste products away from the baby. The cord contains three blood vessels. It is usually stiff and firm, like a garden hose filled with water. Usually, it is not flexible enough to loop around the fetus, although this may occur in rare cases. Only after the baby is born does the umbilical cord become limp and ropelike.

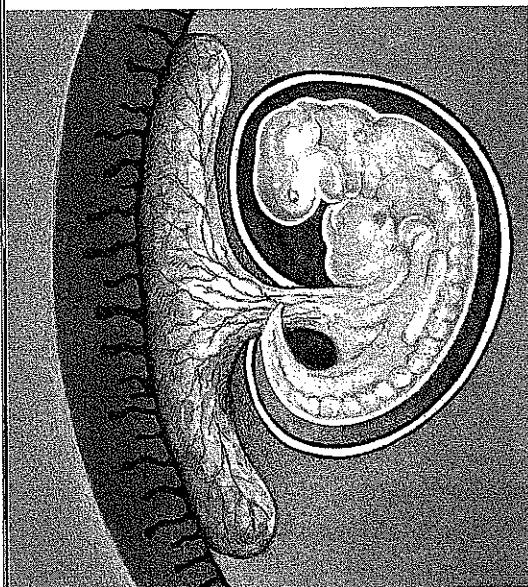
The growing embryo is soon surrounded by a bag of liquid called **amniotic fluid**, a special fluid that surrounds and protects the developing baby during pregnancy. The amniotic fluid acts as a cushion to protect the embryo, even through minor bumps or falls of the mother. The baby remains within this sac of liquid until just before birth.

## Period of the Fetus

The third and last stage of pregnancy begins about the eighth or ninth week and lasts until birth. This stage is called the fetal period, or the period of the **fetus**, the unborn baby from about the eighth or ninth week of pregnancy until birth.

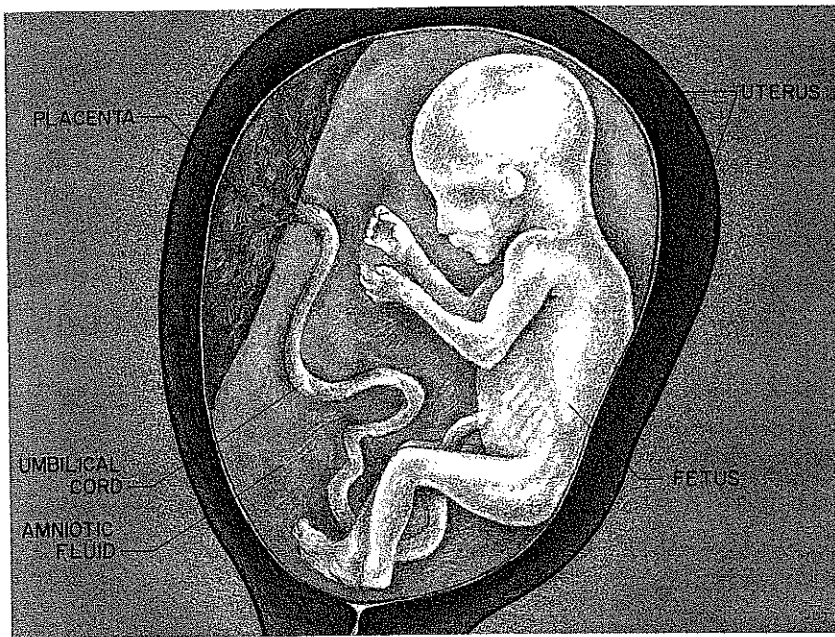
By the beginning of this period, the embryo has developed the beginnings of all organs and body parts. The cells are now recognizable as a developing human. Arms, legs, and even fingers and toes have developed. Facial features are also forming. All the internal organs are present, but they are not ready to function yet. They continue to develop in the remaining months of pregnancy.

Sometime during the fourth or fifth month, the kicks and other movements of the fetus touch the wall of the uterus. These fluttering movements are faint and infrequent at first. Gradually, they become stronger and more frequent. This sensation of feel-



At three weeks after conception, the embryo is surrounded by a sac of amniotic fluid (shown in dark gray). Between the amniotic sac and the uterine lining is the membrane that will soon develop into the placenta. The heart is the largest organ so far and has already begun to beat.



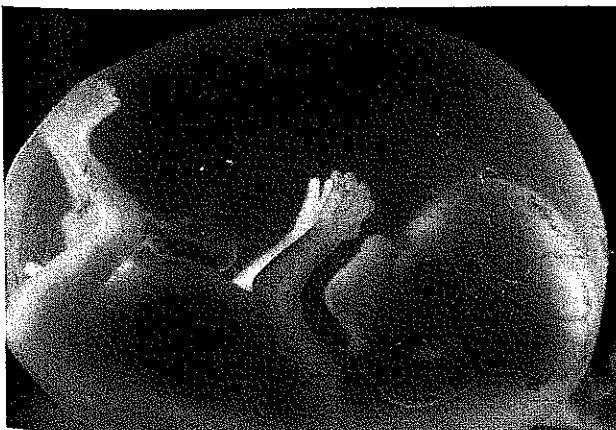


By the fourth month, the fetus looks more like a baby. The eyelids will remain shut until about the sixth month.

ing life, sometimes called quickening, tells the mother that she does, indeed, carry a live child within her. Actually, the baby has been very active long before this time.

Her doctor usually asks the expectant woman when she first felt life. Knowing this helps the doctor estimate the baby's fetal age and project a more accurate delivery date. The fetus's heart-beat can usually be heard before movement is felt.

As the fetus grows, so does the volume of the surrounding fluid. The uterus expands, too, and the woman's abdomen grows. Just before delivery, the amniotic fluid decreases as the baby becomes more active and swallows it. As the fetus grows, it no longer has the room to stretch out. The developing baby curls up in what is called the fetal position.



The fetus floats comfortably within the amniotic sac. After brief active periods, the fetus spends long hours resting. The same will be true of the baby after birth.

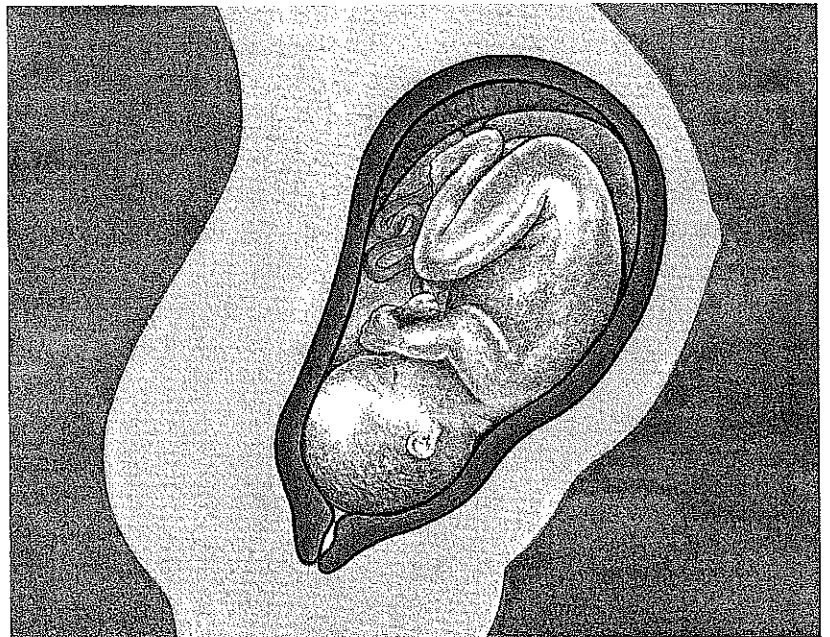


By the seventh month, most fetal development has already taken place. The fetus is capable of living outside the womb, but not without a great deal of medical help. Now the fetus's main task is to get ready for independent life outside the womb. In these remaining months, the major organs become ready to function without the assistance of the mother's body. The fetus also gains weight rapidly. Fat deposits, which will help the baby maintain body heat after birth, are added under the skin. Gradually, the fetus, which had been thin and wrinkled, takes on the smoother, rounder appearance of a baby. During these final weeks of pregnancy, the fetus also stores nutrients and builds immunity to diseases and infections.

The fetus can do a surprising number of things—suck its thumb, cough, sneeze, yawn, kick, and hiccup. A baby can even cry before birth. In almost all cases, the crying is soundless.

Sometime during the ninth month of pregnancy, the baby's weight seems to shift down and the mother feels noticeably more comfortable in her upper abdomen. Lightening has occurred. This means that the baby has dropped into the birth canal. Birth is not far off. With a first baby, lightening may take place several days—or even weeks—before labor begins. If the mother has given birth before, lightening may occur just before the beginning of labor. Sometimes lightening is accompanied by slight abdominal pains, which first-time mothers may mistake for the beginning of labor.

At full term (after nine months of development), the baby has put on weight and settled into the pelvis. The desired position is head down.





At this point in the pregnancy, the fetus is usually upside down, with the head nestled in the pelvis. This is the easiest and safest position for birth. The baby is less active than in previous weeks, because there is so little space in which to move.

The skin of the mother's abdomen appears stretched to capacity. The abdominal muscles are stretched, too. Both are capable of remarkable stretching—and contracting. The muscles of the uterus and abdomen can be stretched up to 60 times their original size during pregnancy, yet they return to nearly their original size within a month or so after the birth.

The nine months of pregnancy bring many changes, both in the pregnant woman and the developing baby. For family members, the signs are clearly evident and their anticipation of a new family member is usually greeted with enthusiasm. After about 40 weeks of preparation, the baby is ready to be born.

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**SECTION****1****REVIEW**

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**CHECK YOUR UNDERSTANDING**

1. What is conception? Where does it take place?
2. During what period of pregnancy do the placenta and umbilical cord develop? Why are they important to the developing baby?
3. What is amniotic fluid? Why is it important to the developing baby?
4. What is a fetus?
5. What is quickening? When does it usually first occur?
6. What are the most important changes that take place in a fetus during the last two months of pregnancy?
7. What is lightening? When does it usually occur?

**DISCUSS AND DISCOVER**

1. What emotional changes do women experience during pregnancy? Read about

these changes, or discuss them with women who are or have been pregnant. Do all women experience the same emotional changes? How do you think a woman's emotional responses to pregnancy vary according to her situation? How do you think a woman's age, marital situation, and economic situation affect her emotions during pregnancy?

**Observing & Participating**

Talk to pregnant females about the physical and emotional changes they have experienced since conception. Record their responses. Identify those changes that all the women share and those that are unique to each woman. Speculate about how you think a woman's emotional responses to pregnancy might vary according to her individual circumstances. How do you think a woman's age, marital status, and economic situation affect her emotions during pregnancy?

## SECTION 2

# A Closer Look at Conception

### OBJECTIVES

- Describe how personal characteristics are inherited.
- Explain how multiple births occur.
- Discuss possible solutions for infertility.



### TERMS TO LEARN

chromosomes  
dominant  
genes  
infertility  
recessive  
surrogate

**P**regnancy is the 40-week period of preparation that begins with conception, when the sperm and egg meet to form a new life. In that meeting of sperm and egg, many of the baby's future characteristics are determined.

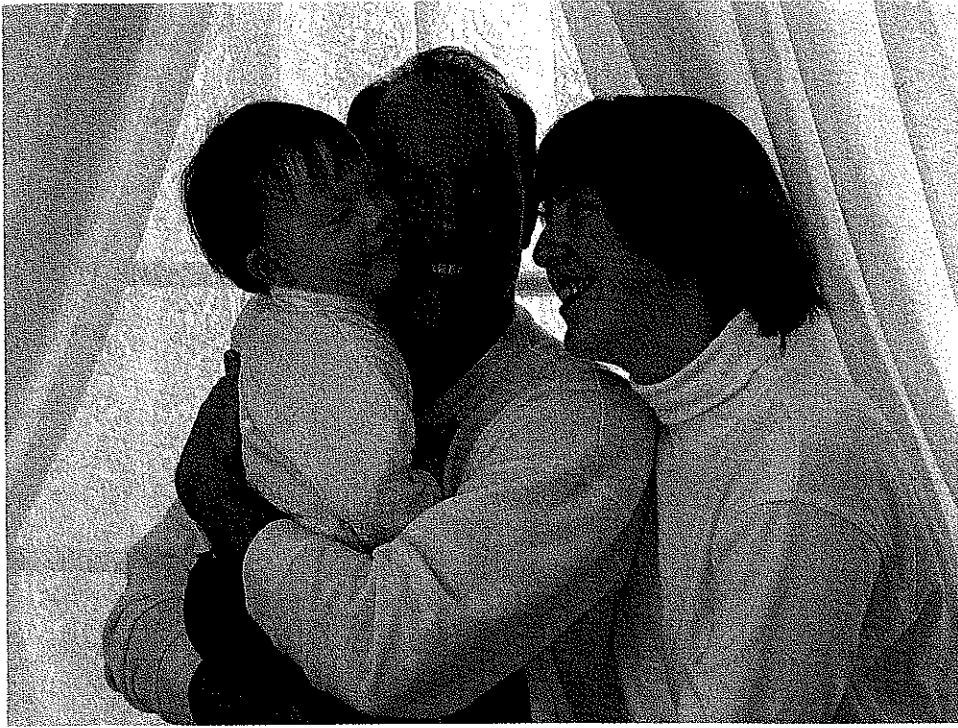
## The Genetic Package

Every individual inherits characteristics from previous generations. Inherited characteristics include such traits as these:

- Physical build.
- Skin color.
- Hair texture and color.
- Color and shape of the eyes.
- Shape and size of ears, hands, and feet.
- Blood type.
- Some medical conditions.

Heredity—the passing on of these and other characteristics—has been observed since ancient times. However, only in the last century has science begun to understand how heredity works.

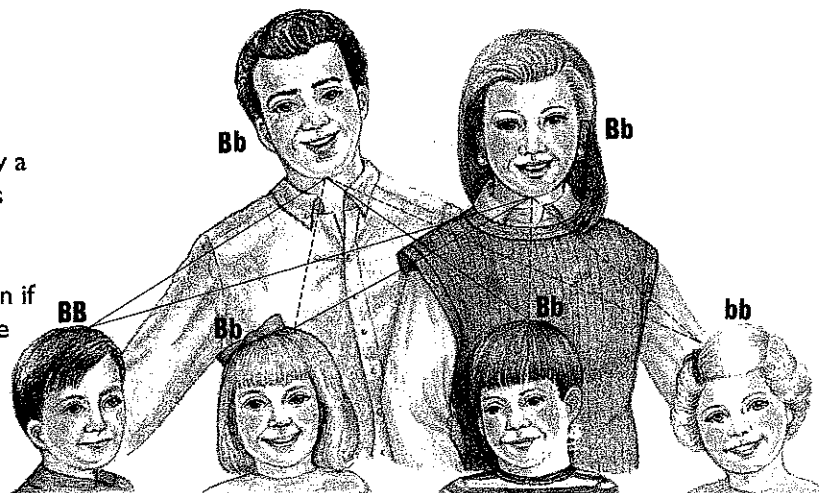
At the moment of conception, every human baby receives a total of 46 **chromosomes**, *tiny threadlike particles in the nucleus of every cell that carry hereditary characteristics*. The father's sperm provides 23 of these chromosomes; the other 23 come from the mother's ovum. Each chromosome contains thousands of **genes**, *the units that determine inherited characteristics*. Genes make up chromosomes as beads make up a necklace. These genes determine all the characteristics—from facial features to coloring to physical size—that each of us inherits.



Hair color is an example of a characteristic that is genetically determined. Each of these parents contributed one recessive gene for red hair to their son. As a result the child's hair is redder than that of either parent.

For every inherited characteristic, an individual receives two copies of a gene—one from the mother and one from the father. When both copies are the same—for example, both for blue eyes—the child is certain to have that characteristic. However, an individual who receives two different genes for a given characteristic—such as one gene for blue eyes and one gene for brown eyes—will have the trait dictated by the **dominant**, or *stronger*, gene. In this example, the gene for brown eyes is dominant and the gene for blue eyes is **recessive**, or *weaker*; the child will have brown eyes. These terms refer only to the relationship of the gene copies to each other. Blue eyes are not weaker than brown eyes.

A person with brown eyes may carry a recessive gene for blue eyes. If this is true of both parents, each of their children has one chance in four of having blue eyes. What would happen if only one parent carried the recessive gene?



Heredity explains why brothers and sisters often resemble each other. It also explains why they can look quite different. Of the father's 46 chromosomes, only half go into the sperm cell—one from each of his 23 pairs. Which chromosome from each pair is used? This is a matter of chance. The same is true of the mother's egg cell. Thus each sperm or egg cell contains a different combination of chromosomes and of genes. The uniting of each sperm and egg creates a unique individual.

At conception, the fertilized egg inherits all the physical traits its parents can ever give it. Though it is less than one-fourth the size of a pinhead, the fertilized egg has its own complete genetic blueprint. This may include its father's brown eyes; its mother's dimples; a grandfather's tall, lean build; and a grandmother's clear, sweet singing voice. These traits—and many, many others—are determined by the particular combinations of genes brought together at conception.

## Sex Determination

The sex of a child is also determined at the moment of conception. It is determined by the special chromosomes that come in two types, X and Y. Each ovum from the female contains an X chromosome. Each male sperm contains either an X chromosome or a Y chromosome. If the sperm that fertilizes the ovum carries an X chromosome, an XX combination results and the child is a girl. If the sperm carries a Y chromosome, an XY combination results and the child is a boy.



## Multiple Births

As you know, a fertilized egg starts growing by dividing into two cells. These cells continue to divide until there are millions of cells.

Sometimes the growing mass of cells splits apart soon after fertilization. Each of these two clumps of cells continues to divide and grow into a separate embryo. This is the process by which identical twins are produced. Identical twins are always the same sex and always have very similar characteristics, because the two babies have developed from one zygote. Why the zygote splits apart is still a mystery of nature.

Unlike identical twins, fraternal twins develop when two eggs are released at the same time and each is fertilized by a different sperm. They grow side by side in the uterus. Fraternal twins can be either the same sex or opposite sexes. They are no more alike in appearance than any other brothers and sisters.



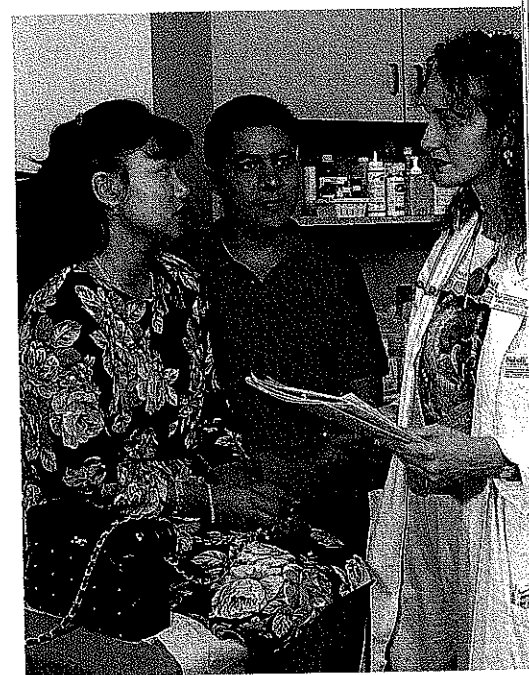
Identical twins share the same genetic pattern. That is why their appearance is so similar. Since a child's sex is determined by the genes, identical twins are always the same sex.

In multiple births of more than two, the babies may be identical or fraternal or a combination of identical and fraternal. Triplets, for example, are identical if the single zygote splits into three parts, each of which continues to develop independently. They are fraternal if three separate ova are fertilized by three different sperm. If the triplets develop from two zygotes, one of which splits apart, there are two identical babies and one fraternal baby.

Multiple births of more than two are usually quite rare, but births of twins are not that rare. In the United States, one birth in approximately 87 is a twin birth. (Identical twins occur only one-fourth as frequently as fraternal twins.)

## Infertility

Not all couples who want to have children are able to conceive. A couple's **infertility**, or *inability to conceive children*, may have many causes. Many couples seek medical advice when they suspect they are infertile, typically after a year of trying without success to conceive. A doctor usually makes a fertility analysis, a detailed physical study of both the man and the woman. The analysis includes taking medical histories and giving both partners thorough physical examinations.



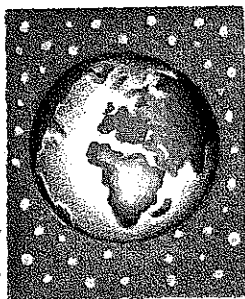
Infertility can be a difficult problem for couples who want to have children. They may decide to undergo a fertility analysis. In many cases, the doctor is able to determine the cause of the infertility and suggest a course of treatment.

## Cultural Exchange

### INTERNATIONAL ADOPTIONS

American families wishing to adopt a child will often explore international adoptions. One reason is the more liberal adoption policies of some foreign countries, another is the speed in which the adoption can be processed. Still other families want to share their homes and lives with someone in great need. As with all adoptions, families follow a procedure. First a reputable agency is contacted and a search is made for a suitable match for the family. Next, arrangements must be made for the release of the child and his or her entry into the United States.

International adoptions have been highly successful for many American families. Today, American parents have become interested in helping their adopted children to understand and think about the country and people that are a part of their heritage. Maintaining a link with their background has helped young people appreciate their past as well as their present way of life.



Often, the fertility analysis reveals that the man, the woman, or both have physical problems that prevent pregnancy. Surgery or medication may solve the problem. For example, the woman's ovaries may not be releasing an egg each month. In this case, the doctor may prescribe fertility drugs, compounds that stimulate a woman's ovaries to release eggs. Fertility drugs, however, have several drawbacks, as do all drugs. Some women who take them are troubled by serious side effects, such as lung problems, abdominal pain, nausea, diarrhea, or dizziness. Also, it can be difficult to determine how much of a fertility drug an individual woman should be given. If she takes too little, there will be no pregnancy. If she takes too much, there may be multiple births. Two or three—or even eight or more—eggs may be released and fertilized at one time. The uterus was not designed to carry so many babies, and they have little chance of survival.

Males also account for a large percentage of infertility problems. Drugs can often be used to assure a man is making enough healthy sperm for conception to occur.

Despite the problems associated with infertility treatment, it is estimated that half of all couples who would otherwise have been childless are able to conceive after medical treatment.

People who are unable to have children often feel, that they aren't normal, that they are less masculine or feminine than others, or that they are alone in facing this situation. Medical and counseling support are usually very important.

### Options for Infertile Couples

A couple who cannot conceive a child themselves may consider several other options.

- **Adoption.** Couples who cannot become parents biologically may choose to adopt. Adoption can be a means of providing a loving home for one or more children who would not otherwise have one.
- **Artificial insemination.** This is the process of injecting sperm into a woman's uterus with a special needle. A doctor does this during the woman's fertile period. The sperm may be from the woman's husband or from another male, usually unknown to the couple, called a donor. Donor sperm is sometimes used by couples in which the man has a history of inherited disorders.
- **In vitro fertilization.** A woman whose damaged Fallopian tubes prevent pregnancy may have a doctor remove a mature egg from her ovary. The egg is placed in a small glass dish containing a special solution, to which her husband's sperm are added. If fertilization takes place, the doctor then



inserts the zygote into the woman's uterus. There, the zygote may attach itself to the lining of the uterus, and a normal pregnancy can proceed.

- **Ovum transfer.** This procedure is sometimes called adoptive pregnancy. An egg obtained from a female donor is fertilized by the man's sperm with in vitro fertilization and then implanted in the uterus of an infertile woman. Ovum transfer is sometimes used by women who lack working ovaries or who have a history of inherited disorders.
- **Surrogate mother.** A **surrogate**, or *substitute*, mother is a woman who carries and delivers a baby for another couple. In some cases, the surrogate carries a couple's fertilized egg, which is removed from the biological mother because she is unable to carry a pregnancy to term. Other surrogates are artificially inseminated with sperm from the husband of an infertile woman. Such options are usually managed through legal arrangements or according to various state laws.

As technology continues to advance, there may soon be other options available. However, the alternatives that science makes possible are not always considered acceptable by everyone. Procedures such as ovum transfer and surrogate motherhood are controversial. They raise many philosophical questions that society has not had to face before.

## SECTION

## 2

## REVIEW

**CHECK YOUR UNDERSTANDING**

1. List at least five traits that an individual inherits from previous generations.
2. What is a chromosome?
3. How many chromosomes does each person have? How many genes does each chromosome contain?
4. What is the difference between a dominant gene and a recessive gene?
5. How is the sex of a baby determined?
6. Explain the difference between identical twins and fraternal twins.
7. What is infertility? List three options for infertile couples who want to have children.

**DISCUSS AND DISCOVER**

1. Discuss the physical traits you think you inherited from previous generations of your family. If possible, make a display of photographs, showing you and various other family members from whom you think you inherited certain traits.

**Observing & Participating**

Take time to observe the behavior and physical characteristics of twins you see in public places or any twins you know. Are they identical twins or fraternal twins? In what ways are the twins in each pair alike? How are they different? If you are acquainted or friendly with any twins, describe how the personalities of the two differ. How are their personalities alike?

## SECTION 3



### TERMS TO LEARN

amniocentesis  
birth defect  
chorionic villi sampling  
miscarriage  
premature  
stillbirth  
ultrasound

# Problems in Prenatal Development

### OBJECTIVES

- Name and describe specific types of birth defects.
- Discuss the causes of birth defects.
- Describe how birth defects can be diagnosed and prevented.

Will the baby be all right? This is a major concern for nearly all parents-to-be. Fortunately, most babies develop normally and are born healthy. For a variety of reasons, however, prenatal development does not always proceed normally.

## Birth Defects

**Premature** babies are *born before their development is complete*. This usually means that the pregnancy was less than 36 weeks. These babies have not had time to gain weight, as weight gain usually takes place during the last month of pregnancy, so they often weigh less than 5 1/2 pounds (2.5 kg). (A full-term baby usually weighs between 7 and 8 pounds [3.2 and 3.6 kg]). Babies can also weigh less than 5 1/2 pounds (2.5 kg) even though they were born on time. These babies are said to be low birth weight babies. Premature babies and low birth weight babies must be given special care. Their small size and incomplete development make them vulnerable to infection, lung ailments, and other problems.

Prematurity is one example of a **birth defect**—*an abnormality, present at birth, that affects the structure or function of the body*. Strictly speaking, almost everyone is born with some type of imperfection. Most, such as birthmarks, are relatively minor. However, some babies are born with more serious kinds of problems, referred to generally as birth defects. In any pregnancy, no matter what the situation, there is a chance the baby will have a birth defect.



Sometimes a baby is born with a serious health problem. Medical science is constantly working to find not only better ways of treating these problems, but ways to prevent them.

## Types of Birth Defects

There are hundreds of kinds of birth defects, with widely differing symptoms and effects. Most, however, are quite rare.

Some birth defects affect the shape or size of the body or of certain parts of the body. For instance, a child may be born with a misshapen foot or an extra or a missing finger. Other birth defects involve a part or system of the body that does not function properly. Blindness, deafness, and mental retardation are examples.

Not all birth defects are apparent at birth. Sometimes the abnormality does not cause problems until months—or even years—have passed.

Birth defects vary widely in their severity. Some are mild or can be readily corrected. Others result in severe lifelong disabilities or even death.

In some cases, if prenatal development is not proceeding normally, a **miscarriage**—the natural ending of a pregnancy before the embryo or fetus could possibly survive—occurs. A **stillbirth** is the natural ending of a pregnancy after 20 weeks. Usually, these losses happen by accident and are not the fault of either the father or the mother.

As soon as they find out they are pregnant, most couples start making plans for their baby. Thus, when they lose that pregnancy, either by miscarriage or by stillbirth, for most, it is the same as losing a child who had been born. They go through stages of grief, as does anyone who has had a family member die. There are special services and support groups for people who have had a pregnancy loss.



Prenatal development is a complex process. When something interferes with it, a birth defect may result. The development of this baby's lip was not completed the way it should have been.

## Causes of Birth Defects

Just as the types of birth defects differ, so do the causes of birth defects. Some are inherited from one or both parents. Others are caused by factors in the environment. Researchers believe that most birth defects result from a combination of environment and heredity. However, the exact causes of many birth defects are not yet fully understood. Some seem to happen totally by chance—not caused by any environmental exposure, and not inherited.



### Environmental Causes

As you have learned, prenatal development takes place very rapidly. In just a few weeks, a baby develops all the bodily systems needed for survival and a normal life. During this prenatal period, the developing baby is completely dependent on the mother's body for nourishment and oxygen.

Many choices the mother makes—as well as many conditions of which the mother may be unaware—can affect the development of her baby. These are some of the environmental factors that can influence the development of a baby:

- The nutritional balance of the mother's diet.
- Any diseases or infections the mother has during pregnancy.
- Harmful substances, such as alcohol, tobacco smoke, and drugs, including some medicines that would ordinarily benefit the mother.
- Exposure to outside hazards such as radiation, especially early in pregnancy.

#### HEALTH TIP

We do not know a “safe level” for possible harmful substances. The best course is to avoid all these substances during pregnancy. Since most women don't realize they are pregnant until the embryo is formed, the ideal is to plan a pregnancy and avoid all possibly harmful substances before becoming pregnant.

People once thought that the placenta was a barrier that protected the baby from many dangerous substances. However, we now know this is untrue.

Everything a pregnant woman takes into her body—pills, injections, food, tobacco smoke, coffee, and alcohol—may affect her unborn child. The placenta may act as a partial barrier, and certain substances may have difficulty crossing to the child. It is now clear, however, that most substances reach the embryo or fetus. If the concentration of any substance in the mother's blood is high enough, some will surely leak across the placenta and reach the fetus.

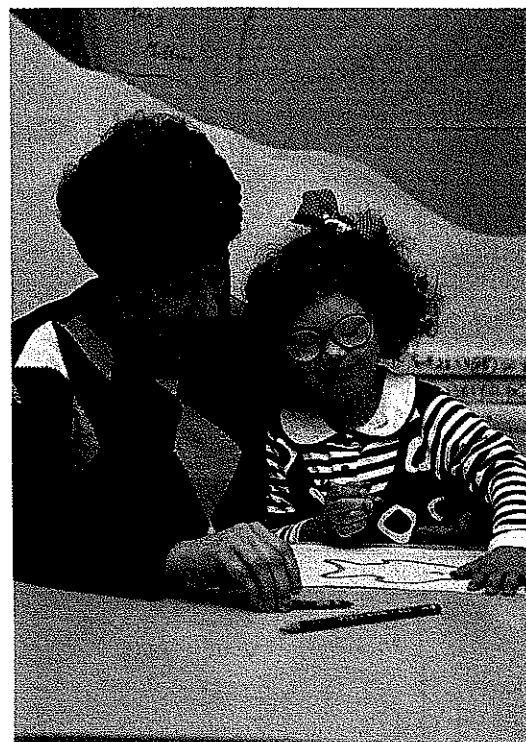
As you can see, how the mother takes care of herself during pregnancy is crucial. An important part of taking care of herself is seeking medical care. A woman should see a doctor as soon as she suspects she is pregnant, and she should follow the doctor's advice to stay healthy.

## Hereditary Causes

Everyone has five or six imperfect recessive genes among the thousands that make up his or her personal blueprint. A single copy of these genes will have no effect on the development of the person with the gene or of a baby to whom it is passed on. However, if each parent passes on the same defective recessive gene, the baby will then have two copies of this gene and therefore will not have a normal gene for the trait determined by this gene. Depending on how important this trait is, there may be a high risk of a birth defect.

Normal genes are usually dominant over defective genes, which are most often recessive. A recessive gene usually produces an effect only when transmitted by both parents. Very often parents do not learn that they carry recessive genes for a particular defect until they have a child born with that defect. If both parents have a recessive gene for the same disorder, *each* of their children has one chance in four of developing that disorder.

Not all hereditary defects are passed on this way. For example, some inherited conditions affect only males. Hemophilia, a condition that prevents the blood from clotting, and color blindness are such conditions. Other defects and conditions are passed straight through families from one affected person to some of their children and grandchildren.



A positive, encouraging approach can help children with Down syndrome make the most of their abilities.

## Interaction of Heredity and Environment

Most birth defects are believed to result from a combination of heredity and environment. For example, sometimes the structure of the heart is defective at birth. Such a defect is usually the result of two factors working together. First, there was an inherited tendency for a heart defect. Second, the defect was triggered by some factor in the environment, such as a drug or a virus. If only one of these conditions had been met, the heart would probably have been normal. This type of interaction between heredity and environment is probably the cause for cleft lip, cleft palate, and spina bifida.

## Errors in Chromosomes

A few types of birth defects are linked to a problem with the affected baby's chromosomes. For example, there may be too many—or too few—chromosomes in each cell of the body. Although this type of defect involves genetic material, it is not the same as a hereditary defect. The child does not inherit the defect from the parents. Researchers are still working to understand why chromosomal errors occur.

## ASK THE EXPERTS

## Sources of Support for Special-Needs Children

*Q. Where can the parents of young children with special needs go for help and support?*

*A.* Special-needs children require extra medical attention; most also require other kinds of professional help in dealing with particular physical, social, or educational problems. In addition, parents and other family members usually benefit from support in coping with the stresses related to their responsibilities.

The first source of help usually is the child's pediatrician or the family's general physician. Physicians are able to refer babies and young children to medical specialists. More and

more, physicians are also able to refer families to other helpful resources within the community.

In many communities across the country, the public school has become an important source of assistance. Services may include center- or school-based preschool classes and home-based instruction. Speech/language therapy, physical therapy, occupational therapy, counseling, and transportation may be

available as well. Many programs emphasize providing parents with the skills to help their developing child.

Some public schools may also provide assessment and support for children from birth to age three.

For emotional support, many parents turn to their own extended families or specific support programs, often affiliated with a local hospital, the

department of social services, or the local, county, or state health department.

*Jackie Mault*

Jackie Mault  
Director of Special Services  
for the Toppenish School  
District in Toppenish,  
Washington



The most common type of chromosomal error is called Down syndrome. One child in every 650 births has this condition. The risk increases as the mother gets older. A child with Down syndrome has an extra chromosome 21, as shown in the photograph on page 137. Because each chromosome carries hundreds of genes, the defect can interfere with development in many ways.



## SELECTED BIRTH DEFECTS

### CEREBRAL PALSY

- ♦ **Description:** Cerebral palsy is a general term for a variety of motor system disorders. The symptoms can include lack of coordination, stiffness, jerkiness, difficulty in speech, and paralysis.
- ♦ **Causes:** Cerebral palsy results from brain damage before, during, or shortly after birth. The causes of the brain damage vary.
- ♦ **Detection:** The symptoms usually become recognizable sometime during the first year of life.
- ♦ **Treatment:** The brain damage associated with cerebral palsy is irreversible. However, physical therapy, speech therapy, occupational therapy, surgery, and medication can minimize the disabilities in many cases.

### CLEFT LIP AND/OR CLEFT PALATE

- ♦ **Description:** A gap in the upper lip and/or palate causes problems with eating, swallowing, speech, and appearance.
- ♦ **Causes:** Often the cause is unknown; it may be hereditary and/or environmental.
- ♦ **Detection:** Both cleft lip and cleft palate are apparent at birth.
- ♦ **Treatment:** Surgery can correct the gap and eliminate the problems associated with it.

### CYSTIC FIBROSIS

- ♦ **Description:** Cystic fibrosis is a functional defect that involves the respiratory and digestive systems. Many of those affected die before reaching adulthood.
- ♦ **Cause:** This is a hereditary condition, carried on a recessive gene. An affected child has two copies of the defective gene, one from each parent.
- ♦ **Detection:** Tests can identify carriers of the gene and can diagnose an affected child or fetus.
- ♦ **Treatment:** There is no known cure for cystic fibrosis. Those affected can be helped by special diets, lung exercises, and treatment of any complications.

### DOWN SYNDROME

- ♦ **Description:** Down syndrome is a group of associated defects that may include mental retardation, delayed development, heart defects, and other characteristics.
- ♦ **Cause:** Down syndrome is caused by a chromosomal error. For reasons not yet understood, there is an extra chromosome 21.
- ♦ **Detection:** The syndrome is detected by an analysis of the chromosomes. Amniocentesis or chorionic villi sampling can detect the syndrome in a fetus.
- ♦ **Treatment:** Those affected benefit from special therapy and schooling and, in some cases, from corrective surgery.

### MUSCULAR DYSTROPHY

- ♦ **Description:** There are many different types of muscular dystrophy; all involve a progressive weakness and shrinking of the muscles. The most common form begins between the ages of two and six.
- ♦ **Causes:** Most types of muscular dystrophy are hereditary. The most common form is transmitted by female carriers of the gene but affects only males.
- ♦ **Detection:** The disease is apparent at its onset. Genetic counseling can identify carriers.
- ♦ **Treatment:** There is no known cure. Physical therapy can minimize the disabilities.

**SELECTED BIRTH DEFECTS (cont'd.)****PKU**

- **Description:** PKU is a condition in which the body is unable to process and use a specific protein. Mental retardation can result.
- **Cause:** This is a hereditary condition, carried on a recessive gene. An affected child has two copies of the defective gene, one from each parent.
- **Detection:** Newborns are tested for PKU, as required by law in all states.
- **Treatment:** There is no known cure for PKU. If it is diagnosed early, a special diet can reduce or prevent brain damage.

**SICKLE-CELL ANEMIA**

- **Description:** Malformed red blood cells interfere with the supply of oxygen to all parts of the body. The symptoms include tiredness, lack of appetite, and pain. Sickle-cell anemia can lead to early death.
- **Cause:** This is a hereditary condition, carried on a recessive gene. An affected child has two copies of the defective gene, one from each parent.
- **Detection:** Sickle-cell anemia can be detected by blood tests. Amniocentesis or chorionic villi sampling can identify anemia in a fetus. Genetic counseling can identify carriers.
- **Treatment:** There is no known cure for sickle-cell anemia. Medication can treat the symptoms.

**SPINA BIFIDA AND/OR HYDROCEPHALUS**

- **Description:** Spina bifida is a condition in which an incompletely formed spinal cord causes partial paralysis. Spina bifida often occurs with hydrocephalus, a condition in which an excess of fluid surrounds the brain, which can lead to brain damage.
- **Causes:** Both hereditary and environmental factors may cause these conditions.
- **Detection:** Both conditions are apparent at birth. A combination of tests of the mother's blood, amniocentesis, and ultrasound can reveal suspected cases in a fetus.
- **Treatment:** Any paralysis or brain damage associated with these conditions is permanent. Corrective surgery, physical therapy, and special schooling can minimize disabilities. Hydrocephalus can often be controlled by an operation performed shortly after birth.

**TAY-SACHS DISEASE**

- **Description:** Babies born with Tay-Sachs disease lack a specific chemical in their blood, resulting in an inability to process and use fats. Tay-Sachs leads to severe brain damage and to death, usually by the age of two or three.
- **Cause:** This is a hereditary condition, carried on a recessive gene. An affected child has two copies of the defective gene, one from each parent.
- **Detection:** Blood tests can identify carriers and can test for the disorder in a newborn. Amniocentesis or chorionic villi sampling can identify Tay-Sachs disease in a fetus.
- **Treatment:** There is no known cure or treatment for this disease.

## Prevention and Diagnosis of Birth Defects

In the past, little could be done to improve the chances of having a healthy baby. Today, organizations like the National Foundation/March of Dimes fund ongoing research into the cause, prevention, and treatment of all types of birth defects. Some causes of birth defects, such as infections, drugs, and alcohol, can be controlled. Although most birth defects cannot yet be prevented, tests can sometimes determine the probability that specific defects will develop. Advances in the detection of defects before birth make early treatment possible.

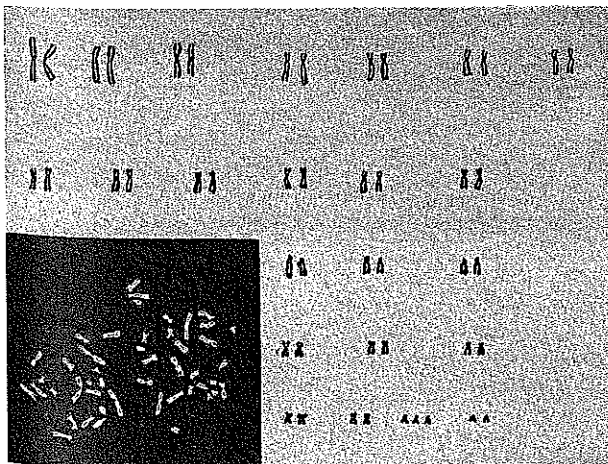
It is difficult for a child born with a serious medical problem to lead a normal life. The rest of the child's family is necessarily affected by the emotional and financial strain the defect causes. Responsible couples do everything they can to minimize the possibility of birth defects.



### Genetic Counseling

Some hereditary or chromosomal defects can be predicted by genetic counseling. This service combines a knowledge of heredity and birth defects with laboratory tests. It tells parents in advance the statistical odds that their children will have certain diseases or defects. The couple can then use this information to plan their pregnancy. Genetic counseling does not tell people what to do; it only explains the options and risks. Most people who seek genetic counseling do so because they are aware of a specific possible problem.

Although genetic counseling may be provided by family doctors, it is best provided by a genetic specialist. Genetic counselors are individuals specifically trained to understand genetic disorders. They have good communication skills, so they



Some genetic defects can be identified by making a photograph of chromosomes from the person's tissues. In the case of Down syndrome, there are three, rather than two of chromosome 21 (bottom row).



Raising a child who has a serious birth defect involves many challenges. Parents are faced with the drain on their finances, emotions, time, and energy. At the same time, family members should treat the child as normally as possible. They need to help the child gain confidence and overcome feelings of being "different."

can explain the situation to the family, and help family members deal with the emotional and financial impact of their specific situation. Genetic doctors are usually specialists either in recognizing and diagnosing genetic conditions or in performing specialized prenatal care. The most specialized testing is done at major medical centers in large cities, but most states have regional services so that genetic counseling is readily available close to home for families throughout the United States.

A genetic counselor begins by obtaining a complete family medical history from the patients. The patients could be a couple who are concerned about their chances of having a child with a serious birth defect or a couple who, because they already have a child with a problem, want more information. Both the husband and the wife are asked for information relating to diseases and causes of death of all their close relatives. They are also questioned about events during this pregnancy and during any previous pregnancies, and they are asked for other relevant information.

The patients—and, in some cases, other family members—may be given thorough physical examinations. If necessary, special laboratory tests are also performed.

When all the questionnaires and tests are completed, the counselor is usually able to tell the couple whether genetic problems are present. The couple may also be told their mathematical chances of having a child with a serious birth defect. The genetic counselor explains the findings and describes alternative courses of action. The genetic counselor does not tell the family which course of action to take. That is always a personal decision for the family.

### Prenatal Tests

If a woman is already pregnant and she or her doctor suspects that a birth defect may be likely, special prenatal tests can be given. These tests determine whether specific birth defects are present. No tests will tell whether a baby will be normal. Some tests may alert the physician to a condition in the baby that must be treated before or immediately after birth. Blood testing to estimate the risk for some defects is common. Although it will not be possible in the foreseeable future to test for all birth defects, new methods of prenatal diagnosis are constantly being developed. Three of the most useful diagnostic procedures are ultrasound, amniocentesis, and chorionic villi sampling.

- **Ultrasound** is a technique of using sound waves to make a video image of an unborn baby to check for specific health problems. It can show whether the fetus is developing on schedule. Certain defects, especially those involving the skeleton and other organs, can also be detected by ultrasound.

Researchers are still studying possible risks of ultrasound. For this reason, most experts advise that ultrasound be used only as part of necessary medical tests. When it is used in



An ultrasound scan produces a picture of the fetus that can give the doctor information about its development.

this way, ultrasound often provides additional information that can be reassuring or helpful to both the parents-to-be and the physician. It can help verify the baby's due date. In addition, ultrasound may reveal the sex of the developing baby or the presence of twins.

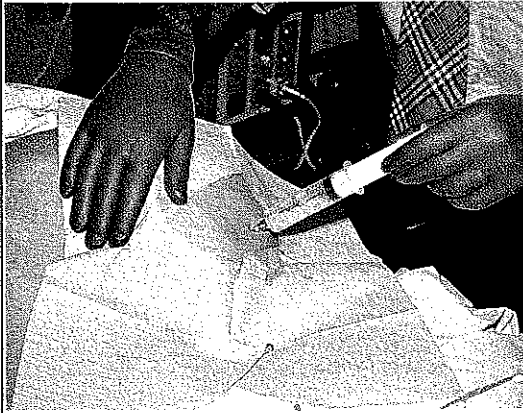
- **Amniocentesis** is the process of withdrawing a sample of the amniotic fluid surrounding an unborn baby with a special needle and testing that fluid for indications of specific birth defects or other health problems. The doctor withdrawing the fluid uses an ultrasound image as a guide when inserting the needle. Some of the cells from the fetus are contained within the sample of amniotic fluid. These cells are tested for evidence of birth defects.

The most common use of amniocentesis is as a test for Down syndrome when the expectant mother is over age 35. Because the procedure involves some risks, including the possibility of miscarriage, it is performed only when there is a valid medical reason. It is always the woman's decision whether or not to have genetic amniocentesis.

- **Chorionic villi sampling** is the process of testing for specific birth defects by sampling small amounts of the tissue from the membrane that encases the fetus. Guided by an ultrasound image, a doctor inserts a catheter, or small tube, through the vagina into the uterus. There, samples of the villi—fingers of tissue that protrude from the chorion, the membrane encasing the fetus—are snipped or suctioned off for analysis.

Chorionic villi sampling is used to test for the same disorders as amniocentesis, but the sampling can be done earlier in a pregnancy. Unfortunately, the risks that chorionic villi sampling will cause miscarriage or birth defects are much greater than the risks involved in amniocentesis. It is performed only after careful consideration of the medical reasons and risks. It is always the woman's decision whether or not to have chorionic villi sampling.

More than 100 kinds of birth defects can now be diagnosed prenatally. In some cases, the problem can be treated before the baby is born. For example, the first child of a Boston woman died at three months of age from a hereditary condition. During her second pregnancy, the woman underwent amniocentesis. The test results indicated that this child also had the condition. A biochemical defect would cause mental retardation in the developing child. Vitamin therapy was administered to the mother, and thus through the placenta to the fetus, to correct the problem, and the baby was normal at birth.



Amniocentesis can detect a number of rare genetic defects. It is performed in the fourth month of pregnancy or later, but only if they suspect a problem.



Several other methods of prenatal diagnosis are now in the experimental stages. These may someday provide more accurate information at earlier stages of development. For example, it has become possible to view the fetus directly through a special instrument, obtain samples of fetal blood and tissue, and even perform surgery on an unborn child. The testing is currently quite dangerous. Further breakthroughs may make these procedures safe enough for widespread use.

Currently in common use are some blood test screenings to estimate the risk for certain birth defects. The information from these blood tests can be helpful to a woman and her doctor when deciding whether there is a valid medical reason to perform one of the diagnostic procedures described above.

## SECTION 3 REVIEW

### CHECK YOUR UNDERSTANDING

1. What is a birth defect? List three kinds of birth defects.
  2. Under what circumstances is a baby considered premature? What special problems does a premature baby face?
  3. What is a miscarriage?
  4. What is the cause of Down syndrome? What is one factor that increases the risk of Down syndrome?
  5. What is the purpose of genetic counseling?
  6. What is the purpose of ultrasound testing during pregnancy? What kinds of defects can be detected by an ultrasound?
  7. What is the difference between amniocentesis and chorionic villi sampling? What risks are involved in each procedure?
2. What stresses do you think are involved in adjusting to life with a healthy new baby? How do those stresses compare with the stresses involved in adjusting to life with a baby who has a serious birth defect? How do you imagine the birth defect affects the baby's parents? Siblings? Grandparents?
  3. Why do you think some couples might have trouble deciding whether or not to seek genetic counseling? What are the advantages of using genetic counselors? Are there any disadvantages? If so, what are they? Do you think a genetic counselor would—or should—tell a couple whether or not they should have children? Why?

### DISCUSS AND DISCOVER

1. Read about the rate of premature births in your community or in your state. Then investigate programs designed to help mothers have healthy, full-term pregnancies. Work with other students to make posters or fliers promoting these programs.

### Observing & Participating

Visit a class or care center for children with severe birth defects. Describe the kinds of problems each child deals with. Explain how the children and the caregivers cope with those problems. What special skills is each child learning? Why? What techniques are used by caregivers to teach these skills?

## SECTION 4

# Avoiding Environmental Hazards

### OBJECTIVES

- Identify the hazards that alcohol and other drugs pose to prenatal development.
- Discuss other environmental hazards that should be avoided during pregnancy.

### TERMS TO LEARN

fetal alcohol effects

fetal alcohol syndrome

**I**n every pregnancy, the mother-to-be is responsible for taking the most important step in increasing the chances of having a healthy baby: She must take care of herself and keep herself safe and healthy. One important part of good prenatal care is understanding the harmful effects of environmental hazards such as alcohol and other drugs, smoking, X rays, and infections.

## Alcohol

Though many people still avoid realizing this fact, alcohol is a drug—and it can be a dangerous one. Ever since ancient times, writers have commented on the poor mental and physical health of children born to alcoholic women. Modern medicine has confirmed these observations. Women who drink alcohol during pregnancy often bear children with a variety of birth defects, some of which can be fatal.

A woman who drinks during pregnancy risks having a child with **fetal alcohol syndrome**, *a condition of physical deformities and cognitive problems resulting from a mother's consumption of alcohol during pregnancy*. Almost all babies born with fetal alcohol syndrome are mentally retarded. This is because alcohol interferes with tissue growth and development, and brain tissue is most easily injured by this interference. Many children born with fetal alcohol syndrome also have other problems, such as slow growth, poor coordination, behavior problems, heart defects, and facial disfigurement.

Children whose mothers drink less alcohol during pregnancy may suffer from **fetal alcohol effects**, *a less severe condition involving some, but not all, of the symptoms of fetal alcohol syndrome*. There is no safe amount of alcohol that a woman can drink during pregnancy without taking the chance of causing harm to her unborn child.

The degree of damage to the child is usually directly related to the amount of alcohol the mother consumed during pregnancy. It may also be affected by the stage of the pregnancy during which she drank and by the presence of other drugs in her system. Because the damage is done before birth, there is no cure for fetal alcohol syndrome or fetal alcohol effects.

Although fetal alcohol syndrome and fetal alcohol effects can't be cured, they can be prevented. Doctors do not yet know just how much alcohol presents a danger to the developing baby. For this reason, most health professionals recommend that pregnant women safeguard the health of their babies by avoiding alcohol altogether when they plan a pregnancy, as well as during pregnancy.

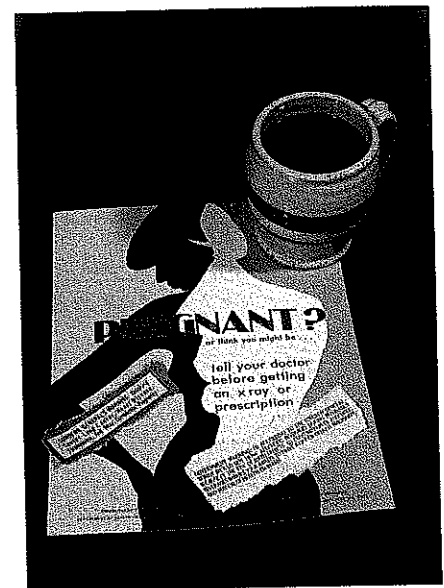
## Other Drugs

Many doctors believe that drugs taken during pregnancy are among the major causes of birth defects linked to environmental factors. The drugs of which pregnant women should be especially aware include the following:

- Alcohol, as you have just read.
- Medicines that doctors prescribe.
- Over-the-counter remedies such as aspirin, cold medicines, nose drops, and vitamins.
- Chemicals such as caffeine, found in some foods and beverages, and nicotine, found in tobacco.
- Illegal drugs such as heroin, LSD, marijuana, crack, and other forms of cocaine.
- Inhalants—fumes that are inhaled into the lungs.

## Prescription and Over-the-Counter Drugs

Every pregnant woman should remember that there is no such thing as a completely safe drug. Even over-the-counter drugs, such as aspirin, cold remedies, and antihistamines, can be dangerous for the unborn child. One extreme example is thalidomide, which was considered a safe drug for relieving the symptoms of morning sickness in pregnant women during the late 1950s. Thalidomide caused severe birth defects in more than 5,000 infants before its effects were discovered.



Over 62,000 nonprescription drugs and other environmental hazards carry warning labels for pregnant and nursing women.

**HEALTH TIP**

It is almost always impossible to predict the effect that any particular dose of a specific medication will have on a developing baby. For this reason, a woman who even suspects she may be pregnant—or who intends to become pregnant—should avoid medicines and other drugs altogether.

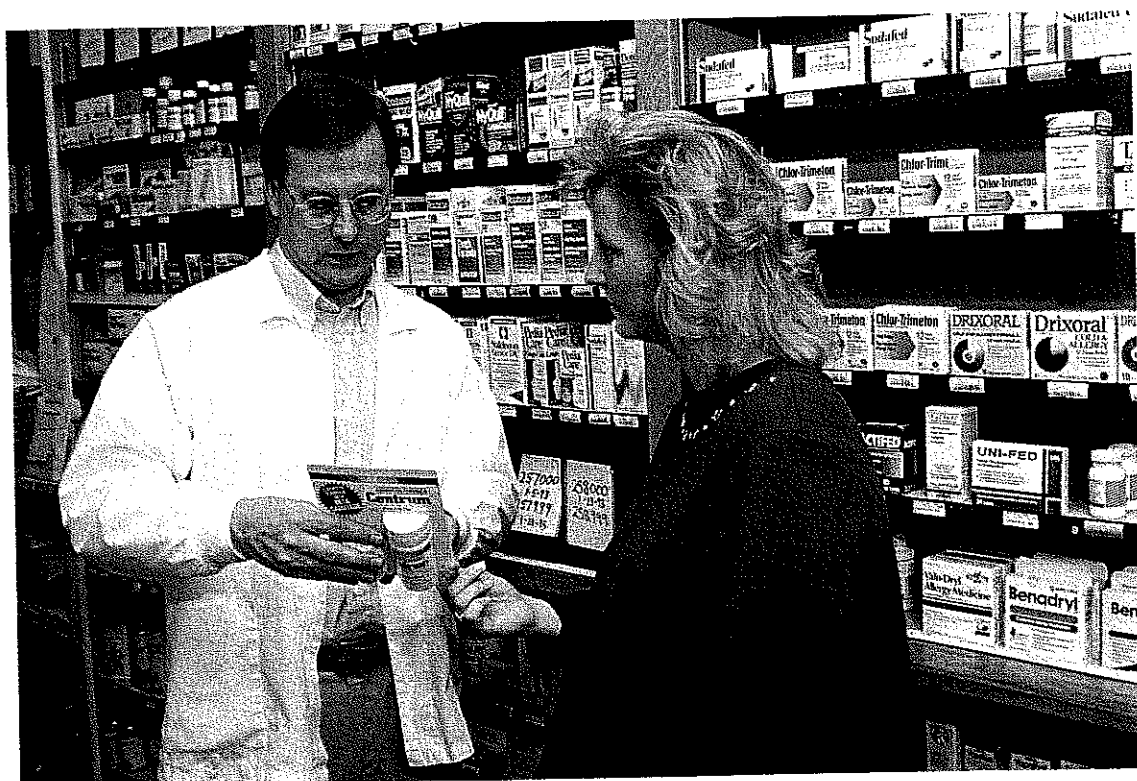
Medicines or infections that reach the fetus through the third month of pregnancy will have their most devastating effect. Any drug a pregnant woman takes reduces the flow of nutrition-bearing blood to the baby. During these months, the body systems, organs, arms, and legs are being formed, so the chances of malformation are greatest during this period. Brain development is also at a critical period, and mental retardation can be caused.

In the last six months of pregnancy, harmful substances that reach the fetus usually cause slow growth, infections, or abnormal bleeding at birth. Drugs taken just before delivery will still be in the baby's body at birth and may cause serious problems.

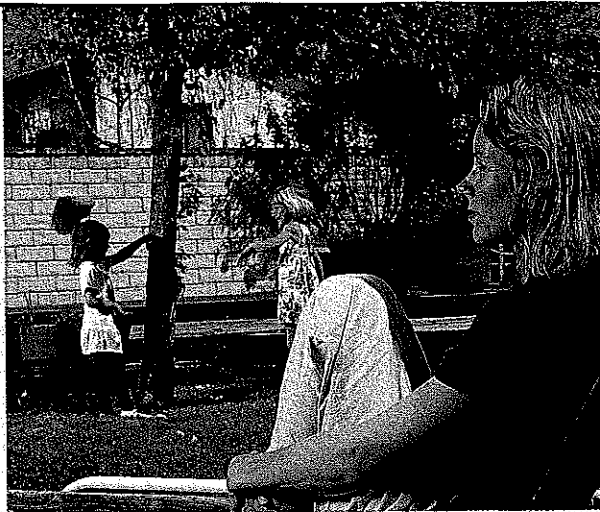
Doctors advise strict limits on the use of medications during pregnancy. A pregnant woman should not take any medicines—even aspirin or vitamins—unless they are specifically prescribed by her physician.

Drugs that are necessary in managing serious conditions, such as diabetes and high blood pressure, can be taken under a doctor's direction. However, a pregnant woman should be encouraged to give up medications for complaints like headaches and hay fever; avoiding such medications can be a worthwhile contribution to the normal development of her baby. In fact, any woman who is likely to become pregnant would be wise to avoid taking unnecessary drugs. Usually, a woman does not know she is pregnant until several weeks after conception has taken place.

An expectant mother should not take any medication unless it is prescribed or recommended by a doctor who knows of the pregnancy. Even vitamin supplements can pose a risk to the unborn baby unless taken under a doctor's advice.



## Decisions Affecting the Unborn



Five-year-old Susan and her four-year-old sister Emily are playing together in their quiet backyard. Emily runs to hide behind a tree. Her movements, however, are slower than those of other four-year-olds. Susan tries to chase Emily. However, instead of running directly to the tree, she stumbles past it.

The girls' mother, Char, sits on a lawn chair and watches them sadly. She recognizes that both her daughters have below-average intelligence, little strength, and, at times, no muscle control. She also sees that, although both girls are quite pretty, slight irregularities in their facial features indicate abnormalities.

For Char, the worst part of her daughters' problems is the knowledge that she herself is the cause of those problems. Char married when she was eighteen.

Since her husband was serving in the army, the couple had to move from one military base to another. Char found it difficult to make new friends, knowing that in a few months she would have to start all over again somewhere else. She began drinking to relieve her loneliness and boredom. Char continued drinking throughout her two pregnancies.

Susan's ailments did not become apparent until after Emily was born. Several months later, the specialists gave the verdict: Both the girls had defects resulting from their mother's drinking during pregnancy.

Char explains, "I'd do anything for my girls. Of course I would have quit drinking—if only someone had told me!" Char did stop drinking, but the change came too late for Susan and Emily.

### THINK AND DISCUSS

1. Why did Char drink during her pregnancies? Why do you imagine no doctor discussed the problem with her? Why do you think her husband and other family members might have avoided discussing it?
2. What could Char have done to overcome her loneliness and boredom instead of drinking?
3. What do you think Char can do now to help her family?
4. Where would you go if you had a drinking problem? What—if anything—would you say to a friend who had a drinking problem?

## Caffeine

Of all the compounds that have been investigated as possible causes of birth defects, none has been so completely taken for granted as caffeine. Caffeine is widely found in beverages such as coffee, tea, cocoa, and many soft drinks, as well as in some foods and many medications. Because it is so common, caffeine

is often not considered a drug. However, pregnant women—and those likely to become pregnant—should be cautious. Women who take in moderate amounts of caffeine probably don't need to worry about birth defects. It is known, however, that feeding large doses of caffeine to pregnant mice and rabbits causes birth defects in their offspring. Doctors usually advise women to be cautious about drinking coffee, tea, and cola during pregnancy.

## Tobacco

The nicotine in cigarettes is also a drug—and a potentially dangerous one. The more a mother smokes, the smaller her baby is likely to be. This is important because the weight of the newborn is a critical factor in the ability to survive. Heavy smoking is also believed to cause premature birth. Doctors advise smokers that they should try to stop smoking before becoming pregnant. If they cannot quit smoking, they should at least cut down during pregnancy.

## Illegal Drugs

Increases in the use of cocaine, marijuana, and other "street drugs" have presented physicians with new problems in preventing birth defects.

A mother who is addicted to drugs at the time of delivery usually passes her addiction on to her baby. Immediately after birth, these addicted infants must go through a period of withdrawal—painful illness resulting from the body's dependence on drugs. Some addicted babies even die as a result of severe withdrawal symptoms. For the babies who survive withdrawal, the future is uncertain. Experts are concerned that the long-range effects of this prenatal addiction may be serious, possibly affecting a child's learning ability and behavior. Many of these children seem unorganized; they are able to follow only very simple directions and are often unable to understand school classes.

Little is known about the specific effects of such drugs as marijuana, cocaine, barbiturates, and amphetamines on a developing fetus. However, considering the fact that even over-the-counter medications are cause for concern, you can see the potential danger of these drugs. Cocaine is known to cause miscarriage, stillbirth, prematurity, and birth defects. Similar results are suggested in studies on marijuana. While this kind of research continues, the best advice is to avoid taking *any* drugs before or during pregnancy.



## X Rays

X rays present another potential danger to the unborn baby. Radiation from X rays or other sources can cause birth defects. A pregnant woman who is in an accident or who is sick should inform medical personnel of her pregnancy. They can then take special precautions if X rays are necessary. For the same reason, she should also be sure her dentist or orthodontist is aware of her pregnancy. It is also important to avoid unnecessary X rays before pregnancy. Both men and women should request abdominal shielding during routine X rays.

## Rubella

The terrible effect of certain infections on unborn children was highlighted by the epidemic of rubella (sometimes called German measles) that swept the country several decades ago. Thousands of unborn babies were affected when their mothers came down with German measles during pregnancy. Although most of the women had few or even no symptoms of illness, the effects on the developing babies were devastating. Because of their mothers' infection with rubella, babies were born with deafness, blindness, heart disease, and/or mental retardation.

A vaccine for rubella is now available, and millions of children have been vaccinated. The vaccine may be dangerous, however, for women who are pregnant or who become pregnant shortly after receiving it. A woman who is unsure whether she has been vaccinated can check her health records. If records are unavailable, she can consult a doctor, who will be able to determine her immunity with a simple blood test. Every woman should be sure she is immune to rubella before she considers pregnancy.

## Sexually Transmitted Diseases (STDs)

Like rubella, sexually transmitted diseases, or STDs, are infections that can have dreadful effects on unborn babies. All the following are sexually transmitted diseases:

- Syphilis.
- Gonorrhea.
- Genital herpes.
- AIDS (acquired immune deficiency syndrome).

- Group B streptococcus.
- Chlamydia.

These and other sexually transmitted diseases can affect prenatal development or be passed on from an infected mother to the developing baby. They can result in serious illness, deformity, or even death.

It is possible for a person to be infected with a sexually transmitted disease without realizing it. For this reason, special measures are often taken to protect unborn babies against the effects of sexually transmitted diseases. Most doctors routinely test pregnant women for syphilis. Such tests are required by law in many states. In addition, doctors usually treat the eyes of newborns with a solution to kill gonorrhea germs that could otherwise cause blindness. The laws of many states make this kind of treatment mandatory.

Drugs and treatment can cure syphilis and gonorrhea and can relieve the symptoms of herpes in adults. Untreated, these diseases can affect the heart, brain, reproductive system, and spinal cord, and can eventually lead to death. No drug can cure the damage to the newborn that results from a delay in diagnosis and treatment. Any pregnant woman who suspects she could have a sexually transmitted disease should discuss the condition frankly with her doctor.

AIDS, a viral infection that attacks the immune system, is a particularly dangerous sexually transmitted disease. There is no cure, and AIDS is invariably fatal. Like other STDs, it can be spread by unprotected sexual intercourse. In addition, individu-

AIDS is a deadly disease with no known cure. Health organizations have developed educational campaigns to inform the public about the realities of AIDS and other sexually transmitted diseases.



als can be infected with AIDS by sharing infected needles or through contact with infected blood. A fetus can be infected with AIDS by the mother. The AIDS virus may lie hidden in a person for many years before causing symptoms, so there is no way to tell whether someone is infected just by looking at him or her. If a woman who has AIDS gives birth to a child, there is a 20 to 50 percent chance that her baby will also develop AIDS and die.

Not all infections in a pregnant woman pose a threat to the developing baby. However, a pregnant woman should tell her doctor about any illness, no matter how mild it may seem.

## Genetic Counseling

Genetic counselors can provide information and answer questions for women who have been exposed to any of the above substances or diseases. A genetic counselor can provide information in response to questions such as these: What is the chance that this substance or disease will cause a problem? Is there any special care needed during pregnancy? Should any special tests be considered?

### SECTION 4 REVIEW

#### CHECK YOUR UNDERSTANDING

1. What causes fetal alcohol syndrome? List three kinds of problems associated with fetal alcohol syndrome.
2. During what period of pregnancy are the harmful effects of medications on a fetus most severe? Why?
3. List two problems that can be caused by smoking during pregnancy.
4. How might a pregnant woman be exposed to radiation? What effect can radiation have on a developing baby?
5. List three problems that may result for the developing baby if a pregnant woman is infected with rubella.
6. List four sexually transmitted diseases.

#### DISCUSS AND DISCOVER

1. The use of alcohol can result in a variety of fetal abnormalities. The defects seem to be

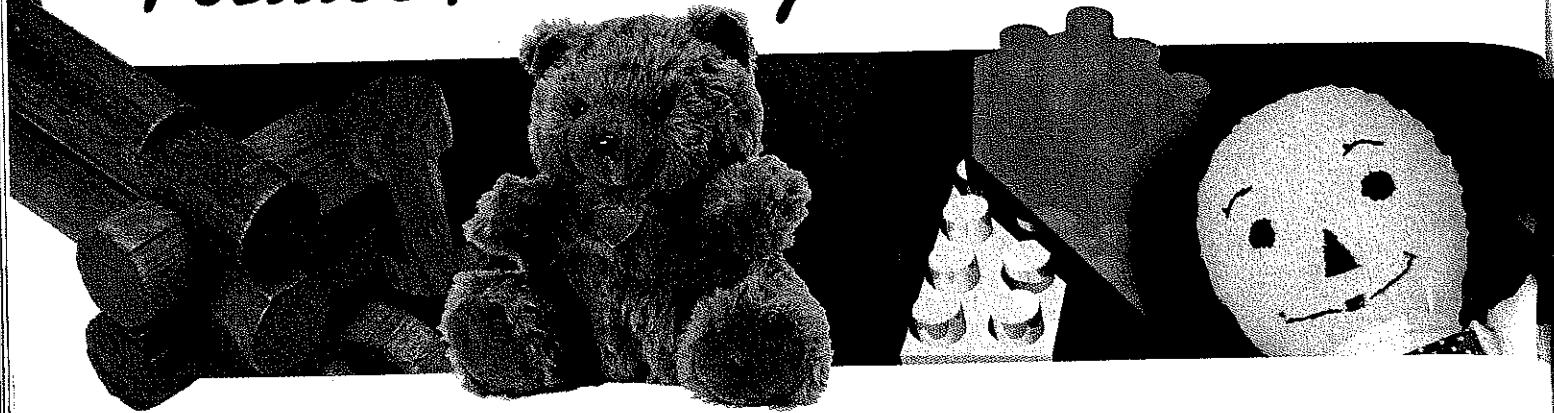
related to the degree of alcohol consumption by the mother. What suggestions would you give to someone who has a drinking problem and is pregnant?

2. It is reported that passive smoking (inhaling others' smoke) has an effect on the unborn child similar to the effect of actually smoking cigarettes. What should a pregnant woman do to protect herself and her developing baby from these harmful effects?

#### Observing & Participating

Poll a group of peers to find out which over-the-counter medications are taken regularly. Which of these medications is considered safe to take during pregnancy? Why? Describe the specific risks that might be involved when taking these medications during pregnancy.

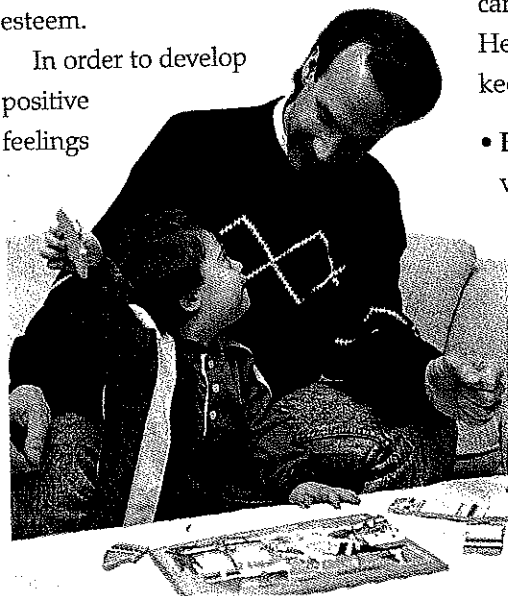
# Positive Parenting Skills



## BUILDING POSITIVE ATTITUDES

**W**henever you spend time with a young child you have the opportunity to help that child feel good about himself or herself. As you continue to study child development, and as you gain experience observing and participating with young children, you will learn many specific techniques to use in guiding children toward positive attitudes. However, you should also keep in mind the importance of your own attitudes and your own self-esteem.

In order to develop positive feelings



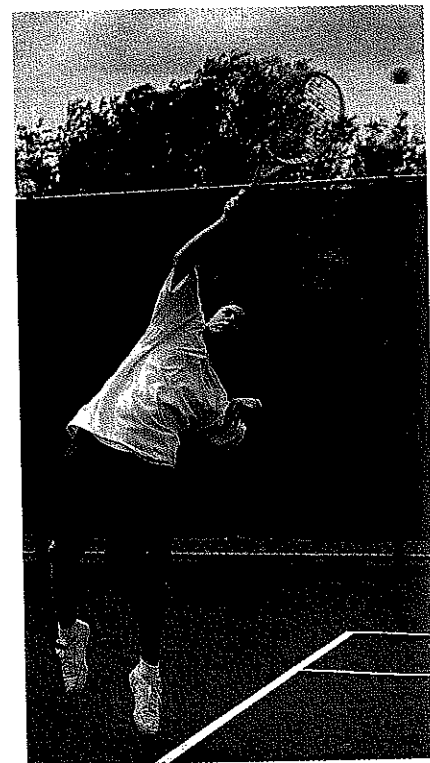
in children, you need positive feelings about yourself. These positive feelings are possible only if you assume responsibility for your own good health.

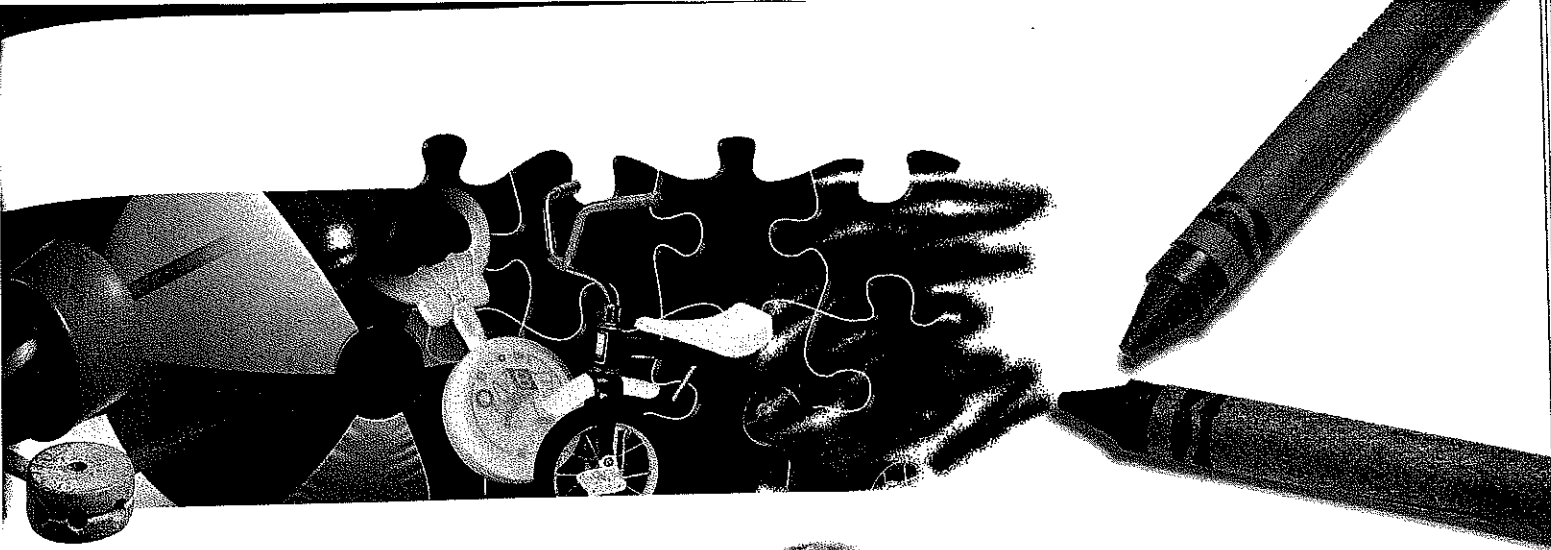
How can maintaining your own good health help you take better care of children? When you feel healthy, you enjoy life—and the people around you. Young children respond to that enjoyment with positive attitudes of their own; your good attitude can help children enjoy you, their environment, and—most important—themselves.

### Physical Health

An essential aspect of maintaining good health is taking care of your physical well-being. Here are some reminders about keeping yourself physically healthy:

- **Eat a balanced diet.** Include a variety of nutritious foods in your diet.
- **Get regular exercise.** Choose sports and other activities that you enjoy, either on your own or as part of a team or other group.
- **Get plenty of sleep.** Remember that eight hours per night is a minimum requirement for most teens.
- **Learn safety rules**—and remember to follow them.
- **Take care of your health and your appearance.** Shower or bathe regularly, keep your hair and nails clean and neat, and brush and floss your teeth daily.
- **Avoid harmful substances.** Harmful substances include tobacco, alcohol, and drugs.





## Emotional Health

Another essential aspect of maintaining good health is caring for your emotional well-being. Every individual has emotional needs, including the need to give and receive love, the need to experience a sense of belonging, and the need to feel worthwhile.

You can foster good emotional health by recognizing your own emotional needs and seeking out situations, activities, and relationships that meet those needs.

In addition, every individual experiences a wide range of emotions. Part of maintaining emotional health is recognizing and accepting all your emotions, and finding safe and appropriate outlets for expressing those emotions.

## Social Health

A third essential aspect of maintaining good health is assuming responsibility for your

own social well-being. You probably think of your social life as involving your friends—and they can make an important contribution to your social health. Your relationships with family members, neighbors, teachers, and others with whom you come in daily contact are also important to your social health. If you enjoy most of these relationships and feel both

supportive of and supported by the people around you, you are developing your own social good health.

You can foster good social health by playing an active part in your community—perhaps by volunteering at a local recycling center or at a

shelter or even in a child care center.

Remember that as you care for yourself, you are also preparing yourself to help care for others.



**SUMMARY**

- Prenatal development begins with conception. It progresses through three stages: the period of the zygote, the period of the embryo, and the period of the fetus.
- Chromosomes carry the genes that determine all inherited characteristics.
- Infertility problems can sometimes be solved through treatment; if treatment is unsuccessful, couples can consider other options.
- Birth defects have a variety of causes.
- Genetic counseling and prenatal tests can predict some birth defects.
- To minimize risks to her unborn baby, a pregnant woman should avoid environmental hazards such as alcohol, other drugs, and tobacco.

**REVIEWING THE FACTS**

1. What is prenatal development? In what three stages does it take place?
2. Which two cells are necessary for conception?
3. What is a uterus?
4. How do unborn babies receive their nourishment?
5. List at least four things a fetus can do.
6. How many chromosomes does each human have? What are the two sources of those chromosomes?
7. Briefly describe how fraternal triplets develop.
8. What is the difference between a miscarriage and a stillbirth?
9. List four kinds of environmental factors that can influence the development of a baby.
10. List three prenatal tests that can be used to test for birth defects.
11. Why should a woman avoid alcohol during pregnancy?
12. What are the potential dangers of street drugs to an unborn child? Why should all drugs—including over-the-counter and prescription drugs—be avoided during pregnancy?

**EXPLORING FURTHER**

1. Investigate one local agency or office through which babies or children can be adopted. How can adults qualify to adopt? Are the qualifications for adopting a newborn different from those for adopting an older child? What fees should adoptive parents expect to pay? What other costs may be involved in the adoption? Share and discuss your findings with other students in your class. (Section 2)
2. Gather pamphlets and other resource materials on birth defects from the March of Dimes or from another organization. Read and discuss the materials. Then make them available to pregnant women, perhaps by giving them to a prenatal clinic. (Section 3)
3. With a partner or a small group, plan and act out a skit about teens being offered alcohol or other illegal drugs. In your skit, demonstrate effective ways to say "no" to drugs. Perform your skit for your classmates. (Section 4)
4. Prepare three hot drinks that a pregnant woman could enjoy in place of coffee. Be sure that none of your drinks contains any caffeine. Serve the drinks to classmates, and ask them to share their reactions. (Section 4)

**THINKING CRITICALLY**

1. **Analyze.** How do you think a woman is affected by the physical changes that take place during pregnancy? How do you imagine most husbands react to these changes? What effects might her husband's responses have on a woman's emotions during pregnancy? On her physical well-being?
2. **Analyze.** How do you think infertility affects a couple? What effects might a diagnosis of infertility have on the relationship between husband and wife? On their relationships with other family members and friends? Why?
3. **Evaluate.** What do you consider valid reasons for prenatal testing? Why? Do you think some women undergo prenatal tests for inappropriate reasons? If so, what are those reasons? What



questions do you think prospective parents should ask themselves before prenatal testing? After they get the results of prenatal tests?

4. **Analyze.** What effects do illegal drugs have on unborn babies? Why, given these effects, do some mothers continue to use drugs such as cocaine and heroin during pregnancy? What, if anything, do you think should be done to help these women? What, if anything, do you think should be done to punish them?

### CROSS-CURRICULUM CONNECTIONS

1. **Science.** Research recent developments in the use of fertility drugs. How has the safety of these drugs been improved? What advantages and disadvantages are associated with the use of fertility drugs? Summarize your findings for the rest of the class.

2. **Reading.** Read *The Broken Chord* by Michael Dorris. Summarize the book for your classmates, and discuss your reactions to it.

### SCHOOL TO WORK

**Finding Job Openings** Whether you are looking for a part-time job as part of your career planning or to save money for personal expenses, locating a job is less complicated if you know where to look. Your school counselor may have a job placement center. Do your family or friends know any job leads? Employment agencies, newspaper advertisements, and government offices may have listings of available jobs. One more tactic is to call companies that interest you and ask the personnel director if there are any job openings that match your qualifications. The more leads you have, the better your chances of finding a position.

### PERFORMANCE ASSESSMENT

#### *Prenatal Development*

##### **Task**

Imagine that you are an unborn infant during the fetal period and you wish to communicate with your mother. Write a letter or a script as if you were talking to her from the womb. Use what you have learned to tell her how you feel she is providing for your prenatal development.

##### **Purpose**

Although you will be addressing an imaginary pregnant mother, your purpose will be to inform potential parents about the effects of environment and behavior on an unborn baby.

##### **Procedure**

1. Draft an outline of ideas you want to include in your letter or script. Think about your sensory perceptions during this stage: What can you hear? Feel? Imagine to see or smell?

2. Focus on either a specific situation or a pattern of behavior. Perhaps your mother attends a party where others are smoking. Maybe your mother does not exercise or works on her feet all day. Don't overlook positive situations, such as when your mother has an ultrasound scan, where she can see you.

3. Use a personal tone of voice to write your letter or script. Demonstrate that you know how environment, nutrition, and behavior influences prenatal development.
4. Proofread your letter or script to correct content, spelling, and grammar. If you wrote a letter, use correct letter form and fold it into an envelope. If you wrote a script, give it a title and identify your characters.

##### **Evaluation**

Your letter or script will be evaluated on your knowledge of content

and the originality and presentation of information. Both should conform to correct standards of spelling, punctuation, and grammar.

#### *Portfolio Idea*

For your portfolio, use a recorder to tape your letter or script. With a vocal recording you can add inflection and tone to your written work. If you want, you may use music or background sounds to embellish your recorded reading. Be sure to begin the tape by stating your name, the lesson name, and the date. Then save both the written letter or script and your recorded message in your portfolio for later review. Make sure each item is labelled properly and stored safely.